

## 5.2 IDENTIFICATION OF HAZARDS OF CONCERN

To provide a strong foundation for mitigation actions considered in Sections 6 and 9, Rockland County focused on considering a full range of hazards that could impact the area, and then identified and ranked those hazards that presented the greatest concern. The hazard of concern identification process incorporated input from the County and participating jurisdictions; review of the New York State Hazard Mitigation Plan (NYS HMP 2014); review of the 2010 Rockland County HMP; research and local, state, and federal information on the frequency, magnitude, and costs associated with the various hazards that have previously, or could feasibly, impact the region; and qualitative or anecdotal information regarding natural hazards and the perceived vulnerability of the study area's assets to them. Table 5.2-1 documents the process of identifying the natural hazards of concern for further profiling and evaluation.

***Hazards of Concern*** are those hazards that are considered most likely to impact a community. These are identified using available data and local knowledge.

For the purposes of this planning effort, the Planning and Steering Committees chose to group some hazards together, based on the similarity of hazard events, their typical concurrence or their impacts, consideration of how hazards have been grouped in Federal Emergency Management Agency (FEMA) guidance documents (FEMA 386-2, "Understanding Your Risks, Identifying Hazards and Estimating Losses; FEMA's "Multi-Hazard Identification and Risk Assessment – The Cornerstone of the National Mitigation Strategy"; FEMA's Local Mitigation Planning Handbook), and consideration of hazard grouping in the NYS HMP.

The "Flood" hazard includes riverine flooding, flash flooding, shallow flooding, ice jam flooding, and dam failure flooding. Inclusion of the various forms of flooding under a general "Flood" hazard is consistent with that used in FEMA's "Multi-Hazard Identification and Risk Assessment" guidance and the NYS HMP.

The "Severe Storm" hazard includes windstorms that often entail a variety of other influencing weather conditions including thunderstorms, hail, lightning, and tornadoes. Tropical disturbances (hurricanes, tropical storms and tropical depressions) are often identified as a type of severe storm. For the purpose of this HMP update, "Severe Storm" includes thunderstorms, hail, lightning, tornadoes, hurricanes, tropical storms, and Nor'easters.

The "Severe Winter Storm" hazard includes heavy snowfall, blizzards, freezing rain/sleet, and ice storms. This grouping is consistent with the NYS HMP.

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Hazard	Is this a hazard that may occur in Rockland County?	If yes, does this hazard pose a significant threat to the County?	Why was this determination made?	Source(s)
Avalanche	No	No	<ul style="list-style-type: none"> <li>Avalanches can occur in any situation where snow, slope and weather conditions combine to create proper conditions. About 90% of all avalanches start on slopes of 30 to 45 degrees and about 98% of all avalanches occur on slopes of 25 to 50 degrees. The topography of Rockland County does not support the occurrence of an avalanche.</li> <li>New York State, in general, has a very low occurrence of avalanche events based on statistics provided by National Avalanche Center – American Avalanche Association (NAC-AAA) between 1998 and 2015.</li> <li>Avalanche was identified as a hazard in the NYS HMP and there have been occurrences in the State; however, there have been no occurrences in Rockland County.</li> </ul>	<ul style="list-style-type: none"> <li>NYS DHSES</li> <li>Input from Steering and Planning Committees</li> <li>Review of NAC-AAA database between 1998 and 2015</li> </ul>
Coastal Erosion	No	No	<ul style="list-style-type: none"> <li>The NYSHMP identifies coastal erosion as a hazard of concern for New York State. Erosion can impact all of the State’s coastal counties along: Lake Erie and the Niagara River, Lake Ontario and the St. Lawrence River, Atlantic Ocean and Long Island Sound, Hudson River south of the federal dam in Troy, the East River, the Harlem River, the Kill van Kull and Arthur Kill, and all connecting waterbodies, bays, harbors, shallows and wetlands.</li> <li>As stated above, the Hudson River is an identified coastal water in New York State. The Hudson River forms the eastern border of Rockland County; however, the geology of Rockland County does not make it susceptible to coastal erosion. Therefore, due to the geology of the County and based on input from the Steering and Planning Committees, coastal erosion is not an identified hazard of concern for Rockland County.</li> </ul>	<ul style="list-style-type: none"> <li>NYS DHSES</li> <li>Input from Steering and Planning Committees</li> </ul>
Dam Failure	Yes	Yes	<ul style="list-style-type: none"> <li>The 2014 NYS HMP identifies dam failure as a hazard of concern for New York State and includes it in the Flood hazard profiles.</li> <li>There are 85 dams located in Rockland County: 56 Class A, 16 Class B, and 13 Class C. The dams are located in the Town of Clarkstown, Town of Haverstraw, Town of Orangetown, Town of Ramapo, Town of Stony Point, Village of Airmont, Village of Chestnut Ridge, Village of Haverstraw, Village of Montebello, Village of Piermont, Village of Sloatsburg, Village of Wesley Hills, and Village of Haverstraw.</li> <li>The Steering and Planning Committees identified dam failure as a hazard of concern for Rockland County. Dam failure is included in the Flood hazard profile.</li> </ul>	<ul style="list-style-type: none"> <li>NYS DHSES</li> <li>Input from Steering and Planning Committees</li> <li>NYSDEC</li> <li>NYS GIS</li> </ul>
Disease Outbreak	Yes	No	<ul style="list-style-type: none"> <li>The 2014 NYS HMP does not identify disease outbreak as a hazard of concern for New York State.</li> <li>While the County has been impacted by various diseases (influenza, Lyme disease), the Steering and Planning Committees did not identify disease outbreak as a hazard of concern for Rockland County.</li> </ul>	<ul style="list-style-type: none"> <li>NYS DHSES</li> <li>Input from Steering and Planning Committees</li> </ul>

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Hazard	Is this a hazard that may occur in Rockland County?	If yes, does this hazard pose a significant threat to the County?	Why was this determination made?	Source(s)
Drought	Yes	Yes	<ul style="list-style-type: none"> <li>• The NYS HMP identifies drought as a hazard of concern for the State. Rockland County has been impacted by several drought events that have occurred in New York State. The NOAA-NCDC Storm Events Database identified 10 drought events between 1950 and 2016 in the County.</li> <li>• Drought conditions can cause shortages in water for human consumption and can lead to reduced local firefighting capabilities. The drought hazard is a concern for Rockland County because the County’s water supply comes from both groundwater and surface water supplies. Additionally, some of the County’s water resources supply communities in New Jersey. Nearly all the water supply for the County is derived from precipitation that falls within the County borders. Periods of below average precipitation can result in mandatory water restrictions. In the short-term, surface water supplies are affected more quickly during droughts than groundwater sources.</li> <li>• New York State has been included in one FEMA drought-related disaster declaration which included Rockland County.</li> <li>• Rockland County has been included in two recent drought-related USDA disaster declarations:               <ul style="list-style-type: none"> <li>○ S3427 – Drought / Excessive Heat – 2012</li> <li>○ S3759 – Drought – 2014</li> </ul> </li> <li>• According to the NRCC, Rockland County is located in the Hudson Valley Climate Division. This division has been impacted by periods of severe and extreme drought including the following events:               <ul style="list-style-type: none"> <li>○ November-December 1908</li> <li>○ May-July 1911</li> <li>○ October 1930 – April 1931</li> <li>○ December 1939 – January 1940</li> <li>○ November 1941 – February 1942</li> <li>○ November-December 1949</li> <li>○ September-November 1957</li> <li>○ June 1964 – August 1966</li> <li>○ April-May 1985</li> <li>○ August-September 1995</li> <li>○ July-August 1999</li> <li>○ November 2001 – April 2002</li> </ul> </li> <li>• Based on previous occurrences and input from the Steering and Planning Committees, drought is identified as a hazard of concern for Rockland County.</li> </ul>	<ul style="list-style-type: none"> <li>• NYS DHSES</li> <li>• FEMA</li> <li>• USDA</li> <li>• Input from Steering and Planning Committees</li> <li>• NOAA-NCDC</li> <li>• NRCC</li> </ul>
Earthquake	Yes	Yes	<ul style="list-style-type: none"> <li>• The NYS HMP identified earthquake as a hazard of concern for the State.</li> <li>• Rockland County has a PGA between 3%g and 5%g. According to the FEMA document</li> </ul>	<ul style="list-style-type: none"> <li>• NYS DHSES</li> <li>• Input from Steering</li> </ul>

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Hazard	Is this a hazard that may occur in Rockland County?	If yes, does this hazard pose a significant threat to the County?	Why was this determination made?	Source(s)
			<p>“Understanding Your Risks: Identifying Hazards and Estimating Losses”, areas with 3%g should conduct a risk assessment for earthquakes.</p> <ul style="list-style-type: none"> <li>• New York State has been included in one FEMA earthquake-related disaster declaration (DR-1145); Rockland County was not included in this declaration.</li> <li>• According to the NYS HMP, between 1973 and 2012, there have been 189 earthquakes epicentered in the State. Of those 189 events, only two had an epicenter in Rockland County.</li> <li>• Based on previous occurrences and input from the Steering and Planning Committees, earthquake is identified as a hazard of concern for Rockland County.</li> </ul>	<p>and Planning Committees</p> <ul style="list-style-type: none"> <li>• USGS – Earthquake Hazards Program, Review of USGS Seismic Maps</li> </ul>
Expansive Soils	Yes	No	<ul style="list-style-type: none"> <li>• The NYS HMP identified expansive soils has a hazard of concern for New York State. However, a majority of Rockland County is underlain by soils with little to no swelling potential and less than 50% of the area is underlain by soils with abundant clays of slight to moderate swelling potential.</li> <li>• The Steering and Planning Committees did not identify expansive soils as a hazard of concern for Rockland County.</li> </ul>	<ul style="list-style-type: none"> <li>• NYS DHSES</li> <li>• Input from Steering and Planning Committees</li> <li>• Review of USGS 1989 Swelling Clays Map of the Conterminous United States</li> </ul>
Extreme Temperature	Yes	Yes	<ul style="list-style-type: none"> <li>• The NYS HMP identified extreme temperatures as a hazard of concern for New York State.</li> <li>• According to the NOAA-NCDC database, between 1950 and 2016, there have been 11 extreme temperature events in Rockland County.</li> <li>• Rockland County has not been included in any FEMA disaster declarations for extreme temperature-related events; however, the County has been included in two recent USDA disaster declarations:                             <ul style="list-style-type: none"> <li>○ S3427 – heat – June 2012</li> <li>○ S3886 – frost/freeze, winter weather – January-May 2015</li> </ul> </li> <li>• Based on previous occurrences and input from the Steering and Planning Committees, extreme temperatures is an identified hazard of concern for Rockland County.</li> </ul>	<ul style="list-style-type: none"> <li>• NYS DHSES</li> <li>• Input from Steering and Planning Committees</li> <li>• NOAA-NCDC</li> </ul>
Flood (riverine, shallow, ice jam, dam failure and flash)	Yes	Yes	<ul style="list-style-type: none"> <li>• The NYS HMP identified flooding as a hazard of concern for New York State.</li> <li>• The County has been included in nine flood-related FEMA disaster declarations:                             <ul style="list-style-type: none"> <li>○ FEMA-DR-311 (Severe Storms and Flooding) – September 1971</li> <li>○ FEMA-DR-487 (Storms, Rains, Landslides &amp; Flooding) – October 1975</li> <li>○ FEMA-DR-702 (Coastal Storms &amp; Flooding) – March-April 1984</li> <li>○ FEMA-DR-974 (Coastal Storm, High Tides, Heavy Rain &amp; Flooding) – December 1992</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• NYS DHSES</li> <li>• Input from Steering and Planning Committees</li> <li>• FEMA</li> <li>• NOAA-NCDC</li> </ul>

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Hazard	Is this a hazard that may occur in Rockland County?	If yes, does this hazard pose a significant threat to the County?	Why was this determination made?	Source(s)
			<ul style="list-style-type: none"> <li>o FEMA-DR-1296 (Hurricane Floyd) – September 1999</li> <li>o FEMA-DR-1534 (Severe Storms and Flooding) – May-June 2004</li> <li>o FEMA-DR-1692 (Severe Storms and Inland and Coastal Flooding) – April 2007</li> <li>o FEMA-DR-1899 (Severe Storms and Flooding) – March 2010</li> <li>o FEMA-DR-4020 (Hurricane Irene) – August-September 2011</li> <li>• Between 1780 and 2015, there have been two ice jams in the County that have occurred along the Ramapo River.</li> <li>• Based on previous events and input from the Steering and Planning Committees identified flooding as a hazard of concern for the County.</li> </ul>	<ul style="list-style-type: none"> <li>• USACE CRREL Ice Jam Database</li> </ul>
Hailstorm	Yes	Yes	Please see Severe Storm	
Hurricane	Yes	No	Please see Severe Storm	
Ice Jams	Yes	Yes	Please see Flood	
Ice Storm	Yes	Yes	Please see Severe Winter Storm	
Infestation	Yes	No	<ul style="list-style-type: none"> <li>• The 2014 NYS HMP does not identify infestation as a hazard of concern for New York State.</li> <li>• According to the New York Invasive Species Map, there have been reported infestations of invasive insects in Rockland County (brown marmorated stink bug).</li> <li>• Based on input from the Planning and Steering Committees, infestation is not an identified hazard of concern for Rockland County.</li> </ul>	<ul style="list-style-type: none"> <li>• NYS DHSES</li> <li>• Input from Steering and Planning Committees</li> <li>• NYSDEC</li> </ul>
Land Subsidence	Yes	No	<ul style="list-style-type: none"> <li>• NYS HMP indicates New York State is vulnerable to land subsidence; however, this hazard is “extremely localized” and poses a “very low risk to population and property.”</li> <li>• NYS HMP does not identify Rockland County as a county that has experienced land subsidence in the past. In general, moderate to low land subsidence susceptibility exists for New York State, however, it was identified that this hazard has a very low risk to population or property.</li> <li>• Sinkholes often occur in areas underlain by carbonate rock, limestone, salt beds or rocks that naturally dissolve by groundwater circulating through them. Portions of western Rockland County are underlain by carbonate rock.</li> <li>• The Steering and Planning Committees did not identify land subsidence as a hazard of concern for Rockland County.</li> </ul>	<ul style="list-style-type: none"> <li>• NYS DHSES</li> <li>• Input from Steering and Planning Committees</li> <li>• USGS</li> </ul>
Landslide	Yes	Yes	<ul style="list-style-type: none"> <li>• The NYS HMP includes landslide as a hazard of concern for New York State. According to the NYS HMP, 30,116 people in Rockland County live within a high incidence of landslide area. The remainder of the population lives within a low incidence area.</li> <li>• Between 1954 and 2016, New York State was included in one landslide-related disaster</li> </ul>	<ul style="list-style-type: none"> <li>• NYS DHSES</li> <li>• Input from Steering and Planning Committees</li> </ul>

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			declaration which included Rockland County. <ul style="list-style-type: none"> <li>Based on the high incidence areas in the County and input from the Planning and Steering Committees, landslide is an identified hazard of concern for Rockland County.</li> </ul>	<ul style="list-style-type: none"> <li>FEMA</li> </ul>
Nor'Easters	Yes	Yes	Please see Severe Storm	
Severe Storm (windstorms, thunderstorms, hurricanes / tropical storms, Nor'Easters, hail and tornados)	Yes	Yes	<ul style="list-style-type: none"> <li>The NYS HMP identified severe storm as a hazard of concern for New York State. However, for the State HMP, the hazards were profiled in individual sections: hailstorm, high wind, and hurricane. For the purpose of this County HMP, the hazards were combined into one profile.</li> <li>The NOAA-NCDC Storm Events Database indicated that Rockland County was impacted by 175 severe storm-related events between 1950 and 2016.</li> <li>According to the SPC, one tornado has impacted Rockland County between 1950 and 2016.</li> <li>FEMA included Rockland County in 11 severe storm-related disaster declarations:                             <ul style="list-style-type: none"> <li>FEMA-DR-311 (Severe Storms and Flooding) – September 1971</li> <li>FEMA-DR-338 (Tropical Storm Agnes) – June 1972</li> <li>FEMA-DR-487 (Storms, Rains, Landslides &amp; Flooding) – October 1975</li> <li>FEMA-DR-702 (Coastal Storms &amp; Flooding) – March-April 1984</li> <li>FEMA-DR-974 (Coastal Storm, High Tides, Heavy Rain &amp; Flooding) – December 1992</li> <li>FEMA-DR-1296 (Hurricane Floyd) – September 1999</li> <li>FEMA-DR-1534 (Severe Storms and Flooding) – May-June 2004</li> <li>FEMA-DR-1692 (Severe Storms and Inland and Coastal Flooding) – April 2007</li> <li>FEMA-DR-1899 (Severe Storms and Flooding) – March 2010</li> <li>FEMA-DR-4020 (Hurricane Irene) – August-September 2011</li> <li>FEMA-DR-4085 (Hurricane Sandy) – October-November 2012</li> </ul> </li> <li>Based on previous occurrences and input from the Steering and Planning Committees, severe storms is an identified hazard of concern for Rockland County.</li> </ul>	<ul style="list-style-type: none"> <li>NYS DHSES</li> <li>FEMA</li> <li>NOAA-NCDC</li> <li>SPC</li> <li>Input from Steering and Planning Committees</li> </ul>
Severe Winter Storm (heavy snow, blizzards, ice storms)	Yes	Yes	<ul style="list-style-type: none"> <li>The NYS HMP identified severe winter storm as a hazard of concern for New York State.</li> <li>The NOAA-NCDC Storm Events Database indicated that Rockland County was impacted by 60 winter storm events between 1950 and 2016.</li> <li>FEMA included Rockland County in four winter storm-related disaster declarations:                             <ul style="list-style-type: none"> <li>FEMA-EM-2107 (Severe Blizzard) – March 1993</li> <li>FEMA-DR-1083 (Blizzard of 96) – January 1996</li> <li>FEMA-EM-3184 (Snow) – February 2003</li> <li>FEMA-DR-1957 (Severe Winter Storm and Snowstorm) – December 2010</li> </ul> </li> <li>Based on previous occurrences and input from the Planning and Steering Committees, severe</li> </ul>	<ul style="list-style-type: none"> <li>NYS DHSES</li> <li>FEMA</li> <li>NOAA-NCDC</li> <li>Input from Steering and Planning Committees</li> </ul>

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Hazard	Is this a hazard that may occur in Rockland County?	If yes, does this hazard pose a significant threat to the County?	Why was this determination made?	Source(s)
			winter storms is an identified hazard of concern for Rockland County.	
Tornado	Yes	Yes	Please see Severe Storm	
Tsunami	No	No	<ul style="list-style-type: none"> <li>Tsunami is not identified as a hazard of concern in the NYS HMP.</li> <li>The Planning and Steering Committees does not consider tsunami to be a significant concern to Rockland County.</li> </ul>	<ul style="list-style-type: none"> <li>NYS DHSES</li> <li>Input from Steering and Planning Committees</li> </ul>
Volcano	No	No	<ul style="list-style-type: none"> <li>The NYS HMP did not identify volcano as a hazard of concern for New York State.</li> <li>The Planning and Steering Committees does not consider volcano to be a hazard of concern for Rockland County.</li> </ul>	<ul style="list-style-type: none"> <li>NYS DHSES</li> <li>Input from Steering and Planning Committees</li> </ul>
Wildfire	Yes	Yes	<ul style="list-style-type: none"> <li>The NYS HMP identified wildfire as a hazard of concern for New York State.</li> <li>Rockland County was not included in any FEMA wildfire-related disaster declarations.</li> <li>Between 2001 and 2015, there are have been several wildfires that burned over 100 acres in Rockland County. Additionally, there have been between 3.5 and 18.5 wildfires per square mile in the County. More recently, there have been several wildfires that burned over 100 acres in the County, with the most recent occurring in November 2016.</li> <li>Based on previous occurrences and input from the Planning and Steering Committees, wildfire is an identified hazard of concern for Rockland County.</li> </ul>	<ul style="list-style-type: none"> <li>NYS DHSES</li> <li>Input from Steering and Planning Committees</li> <li>FEMA</li> </ul>
Windstorm	Yes	Yes	Please see Severe Storm	

- CRREL Cold Regions Research and Engineering Laboratory
- DR Presidential Disaster Declaration Number
- EM Presidential Disaster Emergency Number
- FEMA Federal Emergency Management Agency
- NCDC National Climatic Data Center
- NOAA National Oceanic and Atmospheric Administration
- NRCC Northeast Regional Climate Center
- NYS DHSES New York State Division of Homeland Security and Emergency Services
- NYS HMP New York State Hazard Mitigation Plan
- SPC Storm Prediction Center
- USDA U.S. Department of Agriculture
- USGS United States Geologic Survey



In summary, a total of eight natural hazards of concern were identified as significant hazards affecting the entire planning area, to be addressed at the county level in this plan (shown here in alphabetical order):

- Drought
- Earthquake
- Extreme Temperatures
- Flood (riverine, shallow, dam failure, flash, and ice jam)
- Landslide
- Severe Storm (thunderstorm, hail, wind, tornado, hurricane/tropical storm, and Nor'Easter)
- Severe Winter Storm
- Wildfire

Other natural hazards of concern that have occurred within Rockland County, but have a low potential to occur and/or result in significant impacts, may be considered in future versions of the Plan.